S.Q. TUBE

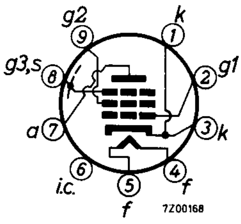
Special quality pentode designed for use as wide band amplifier.

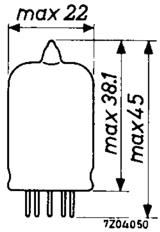
QUICK REFERENCE DATA				
Life test	10 000 hours			
Low interface resistance				
Mechanical quality	Shock and vibration resistant			
Base	Noval. Gold plated pins			
Heating	Indirect A.C. or D.C.; parallel supply			
Heater voltage	V_f		6.3	V
Heater current	I_f		300	mA
Anode current	I_a		13	mA
Mutual conductance	S		16.5	mA/V
Equivalent noise resistance	R_{eq}		330	Ω
Hum voltage	V_{g1}	max.	100	μV

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	300	285- 315		mA
Anode supply voltage	V_{ba}	190			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 supply voltage	V_{bg_2}	160			V
Grid No.1 supply voltage	V_{bg_1}	9			V
Cathode resistor	R_k	630			Ω
Anode current	I_a	13	12.2-13.8	min.11.5	mA
Grid No.2 current	I_{g_2}	3.3	2.9- 3.7		mA
Mutual conductance	S	16.5	14.2-18.8	min. 11	mA/V
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	50			
Internal resistance	R_i	90	min. 45		kΩ
Equivalent noise resistance	R_{eq}	330	max. 650		Ω
Negative grid No.1 current	$-I_{g_1}$		max. 0.5	max. 1.0	µA
Equivalent grid hum voltage Grid resistor R_{g_1} = 0.5 MΩ Centre tap of heater transformer grounded	V_{g_1}		max. 100		μV_{RMS}
Distortion Load resistor R_a = 1 kΩ Input voltage V_i = 100 mV_{RMS}	d_2	1.6			%
Cathode heating time		12	max. 18		sec

CHARACTERISTICS (continued)

		I	II	
Anode supply voltage	V_{ba}	180		V
Grid No.3 voltage	V_{g_3}	0		V
Grid No.2 supply voltage	V_{bg_2}	150		V
Cathode resistor	R_k	100		Ω
Anode current	I_a	11.5		mA
Grid No.2 current	I_{g_2}	2.9		mA
Mutual conductance	S	15.5		mA/V
Cut-off voltage	$-V_{g_1}$		max.4.5	V
Anode voltage	V_a	180		V
Grid No.2 voltage	V_{g_2}	150		V
Grid No.3 voltage	V_{g_3}	0		V
Anode current	I_a	0.8		mA
Start of grid No.1 current	$-V_{g_1}$		max.0.5	V
Grid No.1 current I_{g_1} = 0.3 μA				
Input resistance	r_{g_1}	2000		Ω
Frequency = 100 MHz				
Phase angle of the slope		9		o
Frequency = 50 MHz				
Pin 1 connected to pin 3				
Leakage current between cathode and heater	I_{kf}		max. 15	μA
Voltage between cathode and heater V_{kf} = 60 V				
Insulation resistance between two electrodes			min. 20	MΩ

CHARACTERISTICS AS TRIODE

(g_2 connected to anode)

		I	II	
Anode supply voltage	V_{ba}	160		V
Grid No.3 voltage	V_{g_3}	0		V
Grid No.1 voltage	$+V_{bg_1}$	9		V
Cathode resistor	R_k	620		Ω
Anode current	I_a	16.5		mA
Mutual conductance	S	21		mA/V
Amplification factor	μ	50		
Internal resistance	R_i	2.4		kΩ
Equivalent noise resistance	R_{eq}	225		Ω
CAPACITANCES With external shield				
Anode to grid No.3, grid No.2, cathode and heater	C_{a/g_3g_2kf}	3	2.5 - 3.5	pF 1)
Grid No.1 to grid No.3, grid No.2, cathode and heater				
(I_k = 0 mA) :	C_{g_1/g_3g_2kf}	7.5	6.6 - 8.4	pF 1)
(I_k = 16.3 mA, f = 100 MHz) :	C_{g_1/g_3g_2kf}	11.1		pF 1)
Anode to grid No.1	C_{ag_1}	0.018	max.0.03	pF
Anode to cathode	C_{ak}		max. 0.1	pF
Grid No.1 to heater	C_{g_1f}		max. 0.1	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal-operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

1) Pin No.6 left floating

LIFE

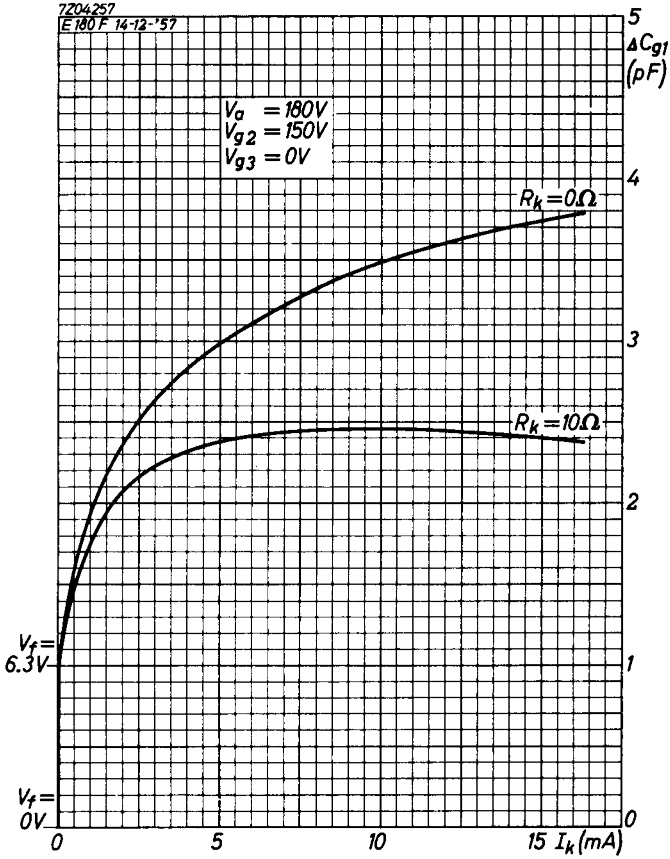
Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

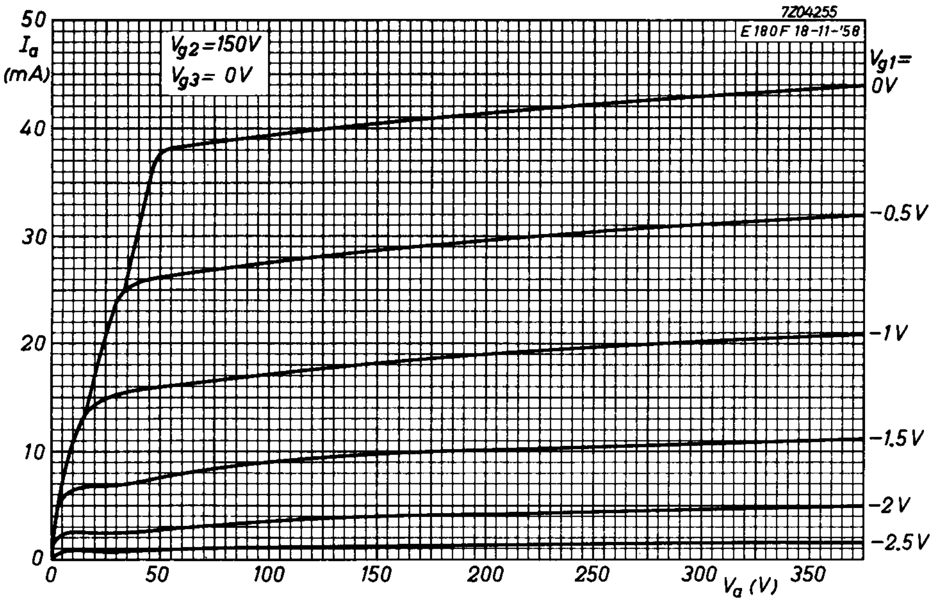
Anode supply voltage	V_{ba}	190	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 supply voltage	V_{bg_2}	160	V
Grid No.1 supply voltage	$+V_{bg_1}$	9	V
Cathode resistor	R_k	630	Ω

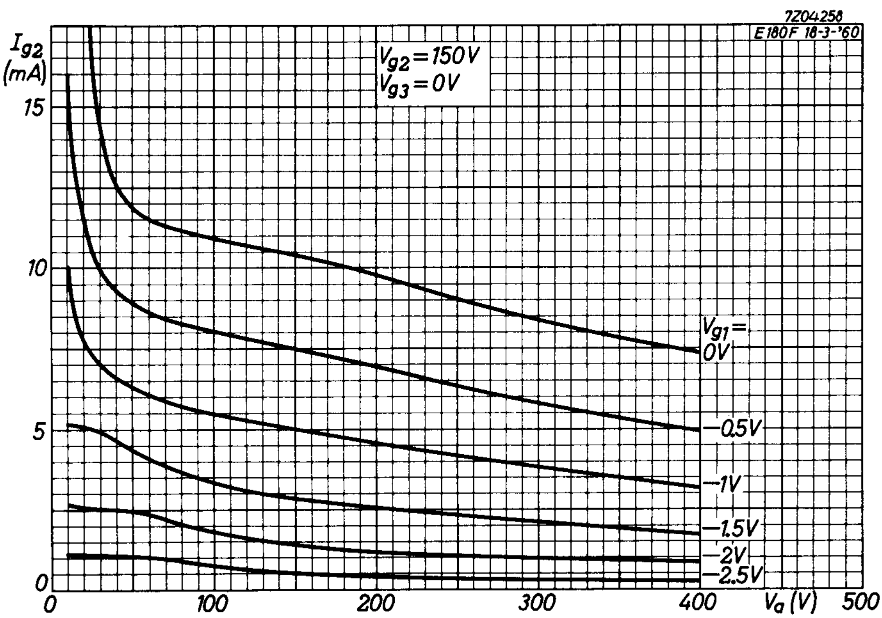
LIMITING VALUES (Absolute max. rating system)

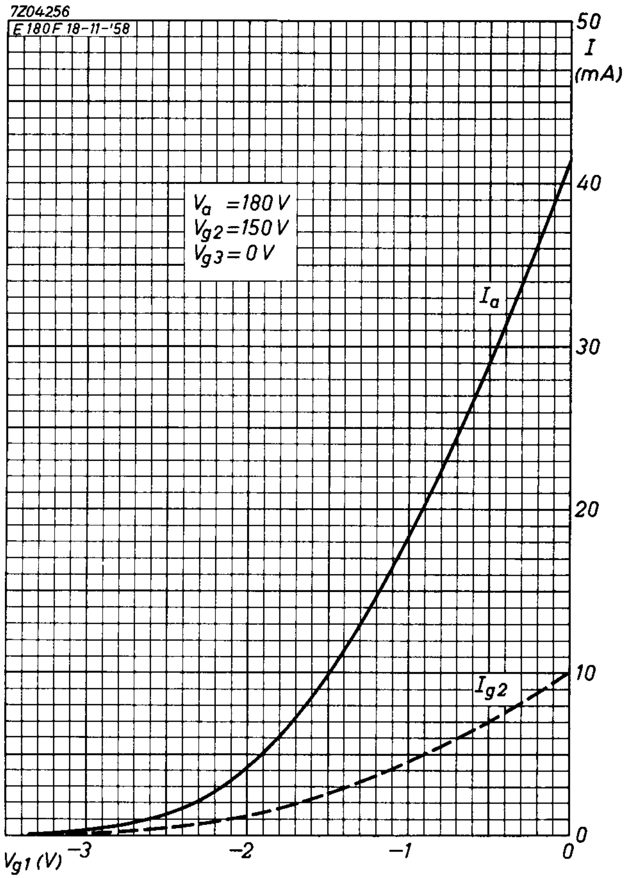
Anode voltage	V_{a_o}	max.	400	V
	V_a	max.	210	V
Anode dissipation	W_a	max.	3	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	400	V
	V_{g_2}	max.	175	V
Grid No.2 dissipation	W_{g_2}	max.	0.9	W
Cathode current	I_k	max.	25	mA
Grid No.1 voltage	$+V_{g_1}$	max.	0	V
	$-V_{g_1}$	max.	50	V
Grid No.1 peak voltage	$-V_{g_{1p}}$	max.	100	V
Grid resistor, fixed bias	R_{g_1}	max.	0.25	MΩ
automatic bias	R_{g_1}	max.	0.5	MΩ
Voltage between cathode and heater	V_{kf}	max.	60	V
Bulb temperature	t_{bulb}	max.	155	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.


7Z04257
E 180 F 14-12-'57
Va = 180V
Vg2 = 150V
Vg3 = 0V
Rk = 0Ω
Rk = 10Ω
ΔCg1
(pF)
5
4
3
2
1
0
Vf =
6.3V
Vf =
0V
0
5
10
15
Ik (mA)


7Z04255
E 180 F 18-11-'58
50
I_a
(mA)
40
30
20
10
0
V_{g2}=150V
V_{g3}= 0V
V_{g1}=
0V
−0.5V
−1V
−1.5V
−2V
−2.5V
0
50
100
150
200
250
300
350
V_a (V)


7Z04258
E180F 18-3-'60
I_{g2}
(mA)
15
10
5
0
V_{g2}=150V
V_{g3}=0V
V_{g1}=
0V
−0.5V
−1V
−1.5V
−2V
−2.5V
0
100
200
300
400
V_a (V)
500


7Z04256
E 180 F 18-11-'58
V_a =180 V
V_{g2}=150 V
V_{g3}= 0 V
I_a
I_{g2}
50
I
(mA)
40
30
20
10
0
V_{g1} (V)
−3
−2
−1
0

PHILIPS

Data handbook

Electronic components and materials

E180F

page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	8	1968.12
9	FP	2000.12.03